First international workshop on usability and accessibility focused requirements engineering (UsARE 2012): summary report

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Abstract: Usability and accessibility issues are common causes why software fails to meet user requirements. However, requirements engineers still focus on functional requirements and might ignore to also elicit system usability and accessibility requirements. This is a high risk which can lead to project and software failure. Improving the usability and accessibility of a system in a later development stage is costly and time consuming. Targeting these concerns, the workshop envisioned that research must address the proper integration of system usability and accessibility requirements into the requirements engineering process and also must focus on how to manage and control the evaluation of these requirements in a systematic way. UsARE 2012 provided a platform for discussing issues which are relevant for both fields, the Requirements Engineering (RE) and the Human Computer Interaction (HCI). The workshop aim was to bring together people from these two communities (RE and HCI) to explore this integration. Researchers and practitioners were invited to submit contributions including problem statements, technical solutions, experience reports, planned work and vision papers. Envisioned results may help aligning RE and HCI processes in order to overcome open issues in these fields.

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First International Workshop on Usability and Accessibility focused Requirements Engineering (UsARE 2012) – Summary Report

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ABSTRACT

Usability and accessibility issues are common causes why software fails to meet user requirements. However, requirements engineers still focus on functional requirements and might ignore to also elicit system usability and accessibility requirements. This is a high risk which can lead to project and software failure. Improving the usability and accessibility of a system in a later development stage is costly and time consuming. Targeting these concerns, the workshop envisioned that research must address the proper integration of system usability and accessibility requirements into the requirements engineering process and also must focus on how to manage and control the evaluation of these requirements in a systematic way.

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Categories and Subject Descriptors

A.0 [**General**]: Conference proceedings, D.2.1 Requirements/Specifications, H.1.2 [**User/Machine Systems**]: Human factors, K.6.3 Software Management

General Terms

Design, Human Factors.

Keywords

Requirements engineering (RE), usability, accessibility, software development

1. INTRODUCTION

Lack of usability and accessibility are common causes for failed software products [1, 3, 4]. Usability is defined by the International Organization Standardization (ISO) as "*the extent to which the product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use*" [2]. Sharp et al. [9] define usability as to achievement of six targeted goals: "*effective to use (effectiveness), efficient to use (efficiency), safe to use (safety), having good utility (utility), easy to learn (learnability), and easy to remember how to use (memorability)*". The accessibility of a system is the capability of the system to be accessed by users with limited capabilities in the same manners as by the normal users. The ISO/IEC Guide 71 [6] defines accessible design as "*design focused on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service*".

During the requirements analysis phase, software development teams may mainly focus on functional requirements. They often ignore system usability and accessibility concerns, such as satisfaction, utility, learnability, memorability and visibility. An early analysis of usability and accessibility requirements can guide the analysis at design-time resulting in a specification that provides more effective criteria to evaluate the software-to-be. Including system usability and accessibility requirements later in the development stages can be very costly [5]. Moreover, ignoring them in early stages could lead to delays in product deployment and can enhance the risks of project and software failure.

The process of requirements collection and elicitation is itself iterative and involves the user representatives. The focus of system usability and accessibility requirements is to ensure that the system is in compliance with the intended properties which let the users to use the system more efficiently in order to achieve their desired goals. Although the Requirements Engineering (RE) field has started to cope with system usability and accessibility issues along other non-functional requirements, there are still a lot of problems and systems often do not provide good usability and accessibility features. Engineering software along the usability and accessibility requirements requires a deeper investigation along the RE process.

2. MOTIVATION AND RELEVANCE

Due to our work and research we realized that it is important to integrate properly the system usability and accessibility requirements into the requirements engineering process and then to maintain them along other system requirements throughout the product life-cycle. However, work on these issues is limited (e.g., [7, 8]) and we could not identify a suitable venue for discussions which focus particularly on the mentioned integration process and its effects on software development. In the following we would like to more deeply discuss motivations and lessons learned from our individual work leading to key research questions.

An important issue we identified is how to identify and elicit system usability and accessibility requirements alongside other system requirements during the requirement analysis phase and then to perform design with respect to these altogether. In iterative and incremental development approaches, the evaluation of system usability and accessibility is needed to be done alongside other functionality testing at the end of each iteration. Therefore, we envision that research on requirements engineering must address the proper integration of system usability and accessibility requirements into the RE process and focus on how to manage and control the evaluation effects on the set of requirements in a systematic way.

Moreover, as software systems are becoming more and more pervasive and require dynamic changes at run-time, usability and accessibility measurements becomes critical to success of such systems. To support changes at run-time in these systems, the involvement of end-users is needed. However, to have unobtrusive approach another challenge is that the evaluation of system usability and accessibility should be performed not only at design-time but also at run-time with respect to dynamic changes in the requirements.

Inspiring from the above motivations and our previous and ongoing work, the workshop aimed at creating awareness in the research and software development communities to start focusing on the following questions:

- How to incorporate system usability and accessibility requirements at early stages of RE;
- How to involve end users in the requirement phases in order to understand the usability and accessibility requirements more properly;
- How to maintain the system usability and accessibility requirements throughout the development alongside other system requirements;
- How to manage and control requirements changes by assessing system usability and accessibility at run-time;
- How usability can improve dynamic elicitation of requirements from the end-users; and
- How requirements for accessibility and usability can be analyzed and managed in case of self-adaptive systems.

3. TOPICS AND GOALS

The workshop was dedicated to observations, concepts, approaches, frameworks and practices that allow understanding, facilitating, and increasing the awareness of the role of system usability and accessibility requirements and their proper integration in the requirements engineering process. Topics of interest for paper submissions included, but were not limited to:

- Eliciting and negotiation of usability and accessibility requirements
- RE and usability/accessibility aspects in Software Development
- User-centered requirements engineering
- Usability and accessibility requirements management
- RE and usability at run-time
- Methodologies, frameworks, concepts, and tool support
- Testing/evaluation
- Case studies and best practices

The workshop aim was the achievement of following goals:

- Consolidate research and practices related to the system usability and accessibility requirements in the overall RE process as a research topic within the greater fields of RE, software engineering (SE), and human-computer interaction (HCI).
- Establishing a platform which will bring RE, SE and HCI people closer together and to discuss how to provide proper integrated approaches/methods to allow “usability and accessibility focused RE”.
- Grow the body of knowledge related to this “usability and accessibility focused RE”, and identifying challenges and future avenues for research relevant for both academia and industry.
- Provide to requirements engineers, HCI experts, business analysts, and software engineers a dedicated forum for exchanging ideas and best practices and thus foster industry-academia collaboration.

4. WORKSHOP SUMMARY

4.1 Organization Committee

- Tiziana Catarci, SAPIENZA University of Rome, Italy
- Anna Perini, Fondazione Bruno Kessler – IRST, Italy
- Norbert Seyff, University of Zurich, Switzerland
- Shah Rukh Humayoun, University of Kaiserslautern, Germany
- Nauman Ahmed Qureshi, National University of Sciences and Technology, Pakistan

4.2 Program Committee

- Margherita Antona, Foundation for Research and Technology - Hellas (FORTH), Greec
- Nelly Bancomo, INRIA – Paris, France
- Yael Dubinsky, IBM Research – Haifa Lab, Israel
- Achim Ebert, University of Kaiserslautern, Germany
- Silvia Gabrielli, Create-Net, Italy
- Ivan Jureta, University of Namur, Belgium
- Stephen Kimani, JKUAT, Kenya
- Sotiriois Liaskos, York University, Canada
- Luisa Mich, University of Trento, Italy
- Barbara Paech, University of Heidelberg, Germany
- Saim Rasheed, King Abdul Aziz University, Saudi Arabia
- Giuseppe Santucci, SAPIENZA University of Rome, Italy
- Pete Sawyer, Lancaster University, UK
- Angelo Susi, FBK-IRST, Italy
- Giuliana Vitiello, University of Salerno, Italy
- Diana Yifan Xu, University of Central Lancashire, UK
- Massimo Zancanaro, FBK-IRST, Italy

4.3 Accepted Submissions

Researchers and practitioners were invited to submit contributions including problem statements, technical solutions, experience reports, planned work and vision papers. Each submission was reviewed by three program committee members, which lead to a total number of seven accepted papers in all categories. The workshop proceeding has been published online by the IEEE digital library [10]. Following is the list of presented papers in the workshop and their brief introduction:

- *How Personas support Requirements Engineering*

(Lydia Schneidewind, Stephan Hörold, Cindy Mayas, Heidi Krömker, Sascha Falke, and Tony Pucklitsch)
Scheidewind et al. describe in this paper how to support personas in the requirement engineering process for highlighting better the user needs.

- *Specifying Usability Features with Patterns and Templates*
(Holder Röder)
Röder provides a pragmatic approach for considering usability features in early phases of software development especially in requirements analysis. The approach is further supported with a catalog of usability patterns for the appropriate selection of software features.
- *Integrating Requirements Engineering and User Experience Design in Product Life Cycle Management*
(Anitha PC and Beena Prabhu)
Anitha PC and Prabhu discuss about the need of Requirements Engineering (RE) and User Experience Design (UXD) in the context of the overall product development life cycle.
- *User Centered Scenario based Approach for Developing Mobile Interfaces for Social Life Networks*
(Pasquale Di Giovanni, Marco Romano, Monica Sebillo, Genny Tortora, Giuliana Vitiello, Tamara Ginige, Lasanthi De Silva, Jeevani Goonethilaka, Gihan Wikramanayake, and Athula Ginige)
Di Giovanni et al. provide an approach for developing mobile interface for social life networking while focusing on people living in developing countries. The presented case study talks about assisting farmers in Sri Lanka for optimizing their crops.
- *Requirements Gathering for Assistive Technology that Includes Low Vision and Sighted Users*
(Stephanie Ludi, Alex Canter, Lindsey Ellis, and Abhisheck Shrestha)
Ludi et al. tackle the interesting issue of how to improve the learning experience of low vision students attending Math and Science classes in order to increase their carrier opportunities as STEM professionals. The presented initial study shows requirements elicitations for the AccessLecture system built to convey lecture materials to those students.
- *Interplay of Usability and Requirements Engineering in Facts Analysis for Patent Lawsuits*
(Edna Rosen)
Rosen proposes a method and guidelines to mix ("interplay") requirements engineering and usability practices for the early detection of usability issues and the plan recovery actions through introducing new requirements particularly devoted to usability. The paper refers to the domain of Patent Lawsuits and focuses on the situation in which a new system has to be introduced in order to support the decisions for the originality of inventions.
- *Usability Requirements Taxonomy for Mobile AAC Services*
(Hrvoje Belani)
Belani presents a new approach, called *augmentative requirements engineering* (ARE), to gather usability and accessibility requirements for mobile ACC services. The presented taxonomy, related to usability requirements for mobile ACC services, highlights some important facets e.g. context, user and its relations and service trustworthiness.

4.4 The Interactive Session

The workshop program was divided into three sessions for paper presentations and one interactive session where the participants got the chance to explore and share ideas and experiences about solved and unsolved problems. The objective of the interactive session was to highlight issues that software development teams face and the possible consequences on software development due to of these issues. The participants were divided into groups where each group was tackling two or three different categories of software development. The identified categorizes were: project management, requirements/business modeling, usability, analysis and design, implementation, and test. Moreover, another category, called *Meta*, was highlighted to tackle the issues that do not fit into any other category. At the end of the interactive session, each group presented a short presentation to provide an overview of the issues highlighted through brainstorming. Following are lists of issues raised in in each category.

- **Meta**
  - **Type of project:** How does the type of project (individual developed vs. product development) influence RE/HCI?
  - **RE/Usability expert:** How does this role model work in small/large companies?
  - User experience (UX) and the AAC primary users.
  - Artifacts, models and relations (understanding the knowledge to be created during engineering).
- **Project Management:**
  - How to compact the techniques for fitting them in agile development approach?
  - How to perform usability and accessibility requirements in small iterations based development approaches (e.g., agile)?
  - How can user-centered approaches be integrated in engineering-dominated projects?
  - Which user-centered techniques are more appropriate at different development levels?
  - How to validate effectiveness of synchronization between Requirements Engineering (RE) and User Experience Design (UXD)?
  - What should be the "synchronized" points between RE & UXD professionals?
  - How to utilize creativity (mixing chaos and strict forms of organization)?
- **Requirements / Business Modeling:**
  - What are the ethnographic methods in requirements engineering?
  - Can requirements be specified fully? If so then how, and if not then how we can develop systems with partial requirements within time and budget?
  - How user tasks can be used to communicate more efficiently within project members?
  - How to involve end-users more effectively in continuous software evolution?
  - What are the ways to introduce UXD and usability into RE?
  - User-centric RE vs. user-cantered design (UCD).
- **Usability**
  - How to define trust as a driver for usability?
  - Usability vs. security.
  - How to identify features that allow defining "good" persona?
  - How to validate "quality" of persona and can we have "evolving" persona?
  - Taxonomy vs. ontology for usability requirements (i.e., which concepts can help in identifying and analyzing usability requirements?)
  - What factors about the users do we need to consider for enhancing usability and if these factors vary from user to user then how we can compare them?
- **Analysis & Design**
  - Should requirement engineers take on UXD responsibilities?
  - How to take interview of experts for knowing the domain knowledge which the interviewer does not have?
  - How the users' mental model be best represented for RE/UXD/usability?
  - What is the level of formalism required for specifying usability requirements?
- **Implementation**
  - What should be the format of "usability" / "user experience" requirements that could be useful during implementation?
  - How the persons can become "usable" for the developers?\
  - Test
  - What are the more appropriate environments for conducting usability tests?
  - Usability tests vs. acceptance tests.

- How to validate effectively user requirements?
- How to automate properly the usability and accessibility requirements alongside testing other requirements?
- How to validate/test UX requirements?
- ACKNOWLEDGMENTS
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